INFORMATION TECHNOLOGY SUPPORT SERVICE

Level II

Learning Guide #28

Unit of Competence: -	**Care for Network and Computer Hardware**
Module Title: -	**Caring for Network and Computer Hardware**
LG Code:	EIS ITS2 M07 1019 LO2-LG28
TTLM Code:	**EIS ITS2 TTLM 1019 V1**

LO2:-Hardware requirements with specified manufacturers

Instruction Sheet	Learning Guide #28

This learning guide is developed to provide you the necessary information regarding the Following content coverage and topics –

- Determining and applying suitable environmental conditions
- Considering orientation and proper functioning of different computer platforms
- Determining and applying System protection devices
- Determining and applying requirements when moving hardware
- Determining and applying suitable storage principle
- Considering and applying business requirements
- Considering OHS standards and environmental concerns

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to –

- Suitable environmental conditions are determined and applied for hardware and peripherals
- General orientation and proper functioning of different computer platforms are considered in locating computer
- System protection devices are determined and applied to keep hardware form damage.
- Requirements are determined and applied when moving hardware.
- Suitable storage principles are determined and applied for hardware and associated peripherals and media.
- Business requirements are considered and applied in respect of hardware location
- Functions of computer hardware and associated OHS standards and environmental concerns are considered

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4 , Sheet 5, Sheet 6 and Sheet 7 ” **in page 1,8 ,15, 18,27,31 and 36** respectively.
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3, Self-check 4 , Self-check 5, Self-check 6 and Self-check 7” **in page 5, 11, 17,26 30,35 and 40** respectively

Information Sheet – 1	Determining and applying suitable environmental conditions

1.1. Environmental conditions

Just like the environmental conditions affect us as humans, computer equipment can also be affected. In order install and maintain equipment to gain the maximum useful life, the environmental conditions need to be considered — factors such as temperature extremes, humidity, dust, electromagnetic interference (EMI), and so on. The following notes are a discussion of these factors.

1.1.1. Temperature

One of the single most important factors in prolonging the life of your computer hardware is the temperature of the components. Components that run hot, have a much shorter life than those that stay cool most of the time. To keep components cool you could use cooling equipment or ensure certain procedures or actions (discussed later). A more general approach is to provide a room environment that is appropriate for the hardware.

A rule of thumb for room temperature is that computers like the temperatures that most people like. That is temperatures between 15 and 24 degrees Celsius. Having computer equipment operating in a hot room that is over 25 degrees Celsius will make general cooling equipment, such as fans, fairly ineffectual.

Some businesses have their air-conditioners on a timer that will shut off at night. In this situation you might want to make sure that computer equipment is switched off overnight, or that a special computer room is designated with independent controls.

Obviously most computer hardware can tolerate being at more extreme temperatures when they are not running. If you are transporting equipment or storing it, the temperature concerns are far less than if the equipment is actually in use. However, if you have equipment that has been exposed to very low temperatures and is then immediately turned on, you risk permanently damaging the equipment. It is essential that very cold equipment be brought up to room temperature slowly before use. This is called acclimation.

When receiving new equipment during very cold weather, it is worth considering that the equipment has been sitting in very cold warehouses or trucks. You may be risking

permanent damage if you switch power up the equipment while still very cold. Of particular concern are monitors, hard disks, motherboards, and chips of all kinds (processor, memory, etc.) This covers most of the computer of course.

Thermal stress is a leading cause of premature failure of electronics components. This is bad enough when the components are raised from 20 degrees to 60, but when they are raised from 0 to 60 it is much worse.

Condensation can be even more destructive. Think about how moisture condensates on a cold bottle, on a warm day, when you take it out of the fridge (usually around 5 degrees Celsius). It is quite possible for this to happen with electronic equipment as well. This does not need to cause any problems, so long as you give the condensation enough time to evaporate. If your hard disk platters have moisture on them when you spin them up, you risk destroying the drive.

The colder the equipment is, the longer it needs to sit to ensure that it comes up to a reasonable temperature before turning it on. In temperatures down 5 degrees, then you might want to wait up to 12 hours. If the device has been allowed to go to below-freezing temperatures, then wait 24 hours for the device to acclimate before plugging in the power. A more humid environment will make condensation more of a problem.

1.1.2. Humidity

As with temperature, computers prefer moderate humidity as opposed to either extreme. While computer equipment is not as sensitive to humidity as temperature, they can still be affected by it.

Obviously, computers are best kept dry. That means keeping it away from places or things that can get it wet. Consider the inappropriate positioning near a window if it is frequently opened, and be wary of beverages placed near the computer that could spill on it and short it out.

Using computer equipment in a humid area can be problematic, if the climate is extremely humid. Using a computer in a tropical rainforest is an example of extreme humidity. Humidity leads to corrosion and possible condensation risk, which can damage equipment. It also makes cooling the computer more difficult.

Conversely, air that is too dry can cause problems in two different ways. First, it increases the amount of static electricity that is in the room, increasing the chances of a

discharge. Second, it can cause faster wear on some components that dry out over time. This includes some types of capacitors, as well as rubber rollers on laser printers.

1.1.3. Dirty environments

Computers operate best when they are used in a clean environment, and when they are cleaned regularly. Most offices and homes are clean enough that a computer requires no special treatment other than regular cleaning as part of routine preventive maintenance. Industrial environments however can be quite destructive on computer equipment.

Computer systems that are going to be used in dirty environments should be protected or cleaned often. Cleaning would also mean taking the covers off and cleaning the inside. If you get the chance to see the inside of a system unit that has been in an industrial environment, you will be amazed how much dirt accumulates.

One easy preventive measure is to use an air cleaner in the room where the computer is located. There are also special cases and enclosures for computer hardware designed for industrial environments to safeguard against damage due to dirt. The typical office owner only has to remember to clean their equipment occasionally and no problems will generally result

Now this might be stating the obvious, but cigarette smoke is bad. The simple fact is that cigarette smoke, especially in high concentration, contaminates and damages computer equipment. The smoke particles are very small and work their way into all sorts of places that they do not belong. The most common problems relate to storage devices. The very fine particles accumulate on read/write heads and the storage media, such as floppy disks.

1.1.4. Electromagnetic interference (EMI)

Probably everyone at some stage has had a radio on when there is an approaching thunderstorm. You would clearly hear the crackling and noise distortion coming from the radio. That crackling is the result of electromagnetic interference, often referred to as EMI.

All electronic devices give off electromagnetic emissions. This is radiation that is a by-product of electrical or magnetic activity. Unfortunately, the emissions from one device can interfere with other devices, causing potential problems. Just like the crackling on the radio, interference can lead to data loss, picture quality degradation on monitors, and other problems with your PC, television set or other devices.

EMI emissions are a two-way problem; emitted by the computer system, and EMI received by the computer system. PCs generally do not cause very much interference with other devices. As with many other electronic devices, they should be certified as Class B compliant with the Federal Communications Commission (FCC). This certification shows that the PC conforms to standards that limit the amount of EMI that a PC can produce. As metals absorb EMI, you have to keep the metal covers on the computer.

PCs can be affected by electromagnetic interference from other devices, in two major ways. One is direct effects through proximity with other devices; another is electrical interference over the power lines.

Try this quick test:

1 Hold a mobile phone near next to an operating monitor

2 Send an SMS message to someone you know.

3 Watch the effects on picture quality.

While a more colourful test would be to place a strong magnet next to a monitor, it is not recommended as sometimes the effects can be long-lasting. Degauss is the process that demagnetises the metal components in the cathode ray tube (CRT), eliminating image distortion that can result from magnetic charges acquired by the components. Some new monitors degauss automatically whenever you turn on your monitor.

Most PCs generally do not have many problems with EMI, but for those that do, there are things that you can do to reduce EMI:

- **Physical isolation:** Devices that emit electromagnetic radiation should be kept a reasonable distance from your computers, peripherals and media. This includes television sets, radios, lights, kitchen appliances, and stereo speakers. Speakers designed for use with PCs are generally shielded and are much less of a problem.
- **Use dedicated circuits:** Some office buildings have separate power circuits that are intended for use by computer equipment. Keeping your computer on a circuit that is separate from the circuit running your refrigerator, arc welder, air conditioning unit etc., means that there will be much less interference passing to the computer from the other

devices. The added benefit is this will also improve the quality of the power being sent to your machine in general.

- **Power conditioning:** The use of a line conditioner or uninterruptible power supply can filter out interference caused by other devices that share a line with your computer.

Self Check 1	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

I. Write the answer briefly

1. List Environmental conditions affect?

2. List things that you can do to reduce EMI?

Note: **Satisfactory rating – 1 points** **Unsatisfactory - below 1 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Information Sheet – 2	Considering orientation and proper functioning of different computer platforms

2.1. Determine any requirements as specified by the hardware manufacturer

If the manufacturer produces substances that may be deemed hazardous, then additional obligations apply. There are documents known as Material Safety Data Sheets or MSDS. A MSDS should be prepared by the manufacturer and include information on the recommended use of a substance, its physical and chemical properties, relevant health hazard information and information concerning the precautions to be followed in relation to the safe use and handling of the substance.

In a more general context, with virtually all equipment produced, the manufacturer is required to provide relevant safety information. This information is often provided as part of the user instruction/manual for safe operation. The following is a typical set of Safety Instructions for a combined Printer/Scanner/Copier.

Example: Safety instructions

Read all of the instructions on this section when setting up and using the product.

When choosing a place for the product

- Avoid places subject to rapid changes in temperature and humidity. Also, keep the product away from direct sunlight strong light and heat sources.
- Avoid places subject to dust, shocks and vibrations
- Leave enough room around the product to allow for sufficient ventilation.
- Place the product near a wall outlet where the plug can be easily unplugged.
- Place the product on a flat, stable surface that extends beyond this product base in all directions. If you place the product near the wall, leave more than 10cm between the back of the product and the wall. The product will not operate properly if it is tilted at an angle.
- When storing or transporting the product, do not tilt it, stand it on its side, or turn it upside down; otherwise, ink my leak from the cartridge.
- Leave more than 22cm between the base of the product and the edge of the surface on which it is placed; otherwise, the product may fall if tipped forward possibly causing injury.

When choosing a power source

- Use only the type of power source indicated on the label on the back of the product.

- Be sure your AC power cord meets the relevant local safety standards.
- Do not use a damaged or frayed power cord.
- If you use an extension cord with the product, make sure that the total ampere rating of the devices plugged into the extension cord does not exceed the cord's ampere rating. Also, make sure that the total ampere rating of all devices plugged into the wall outlet does not exceed the wall outlet's ampere rating.

When handling ink cartridges

- Do not open the ink cartridge packages until just before you install them.
- Do not shake used ink cartridges; this can cause leakage.
- Keep ink cartridges out of the reach of children. Do not allow children to drink from or otherwise handle the cartridges.
- Be careful when you handle used ink cartridges as there may be some ink remaining around the ink supply port. If ink gets on your skin, wash the area thoroughly with soap and water. If ink gets into your eyes, flush them immediately with water. If discomfort or vision problems remain after a thorough flushing, see a doctor immediately.
- Do not touch the circuitry that is located on the back of the cartridge.
- Do not remove or tear the label on the cartridge; this can cause leakage.
- Store each ink cartridge so that the bottom of its packaging faces down.

When using the product

- Do not put your hand inside the product or touch the ink cartridges during printing.
- Do not block or cover the openings on the product.
- Do not attempt to service the product yourself.

Unplug the product and refer servicing to qualified service personnel under the following conditions:

- The power cord or plug is damaged.
- Liquid has entered the product.
- The product has been dropped or the cover damaged.
- The product does not operate normally or exhibits a distinct change in performance.

Do not insert objects into the slots on the product.

Take care not to spill liquid on the product.

Leave the ink cartridges installed. Removing the cartridges can dehydrated the print head and may prevent the product from printing.

If the product has a LCD panel

Use only a dry, soft cloth to clean the display. Do not use liquid or chemical cleansers.

If the display on the product is damaged, contact your dealer.

If the liquid crystal solution contained in the LCD panel leaks out and gets on your hands, wash them thoroughly with soap and water, if the liquid crystal solution gets into you eyes, flush them immediately with water, if discomfort or vision problems remain after a though flushing, see a doctor immediately.

Before installing software we often need to know if a computer meets that software's minimum hardware requirements, like the type of **processor**, the amount of physical **memory**, the screen **resolution** or (not really a hardware issue pur sang) available **harddisk space**.

I. Processor

The processor number is one of several factors, along with processor brand, specific system configurations and system-level benchmarks, to be considered when choosing the right processor for your computing needs.

A higher number within a processor class or family generally indicates more features, but it may be more of one and less of another. Once you decide on a specific processor brand and type, compare processor numbers to verify the processor includes the features you are looking for.

Intel’s processor number system is used with the following brands:

For Example

Requirement Type	**Requirement**
CPU	For **one** index server per TREX instance: □ At least 2 CPUs □ Recommended: 4 CPUs With **two** index servers per TREX instance: At least 4 CPUs. The supported processors are listed in the TREX installation guide.

II. Physical Memory

Memory is the main component of a computer system. It stores instructions and data in binary form that is used by the central processing unit.

For Example

Requirement Type	Requirement
RAM	At least 2 GB per CPU

III. Disk Space

Hard-disk requirements vary, depending on the size of software installation, temporary files created and maintained while installing or running the software, and possible use of swap space (if RAM is insufficient).

A minimum base installation requires at least 15MB of disk space but you should assume that your actual disk space needs will be much larger.

For example, if you install many contributed modules and contributed themes, the actual disk space for your installation could easily be (and likely will be) larger than 60 MB (exclusive of database content, media, backups and other files which should be considered too when planning for your site).

IV. Network Connections

Network Connections provides connectivity between your computer and the Internet, a network, or another computer. With Network Connections, you can configure settings to reach local or remote network resources or functions.

Self Check 2	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

I. Write the answer briefly

1. List instruction when choosing a power source?

2. List instruction when handling ink cartridges?

Note: **Satisfactory rating – 1 points** **Unsatisfactory - below 1 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Information Sheet – 3	Determining and applying System protection devices

3.1. Power conditioning

There are many issues with computers that are ultimately related to power problems. Providing a good, reliable power source to your computer, and peripheral, is another aspect of system care. We should take a look at how to avoid power problems, as well as energy conservation and other issues related to the use of power.

Typical power problems

There are a number of terms related to power and problems, some of the most common are:

- **Blackouts:** When power levels drop to virtually zero, or in other words there is NO power.
- **Brownouts:** Also called sag. A brownout occurs when power levels drop below that which is suppose to be delivered, for a sustained time. For example if you have a 230-240 volt power outlet, but the measurable level drops below 230 volts. Typically experienced in switching on of heavy equipment.
- **Surges:** Is the opposite of a brownout. It is where voltage levels increase above that which is specified at the outlet eg above 240 volts
- **Spikes:** A short sharp and very sudden increase of voltage, that also drops just as quickly eg a 240 volt supply jumps to 1000 volts or more for a period of as little as 20 milliseconds (1/50th of a second). This is typical of a lightning strike.

Protection from power problems

When power problems strike, they can cause permanent damage. The damage could be to your equipment or your data. The only effective way to deal with power problems is to prevent them from happening in the first place. Here are some steps you can take to greatly reduce the chances of power problems with your computer:

- **Power Control:**
- There are different devices that enable us to control power. Their function varies from device to device depending on what we use.
    - **UPS** (Uninterruptible Power Supply):

A UPS helps in black out situations when the power is gone totally and brown outs, when voltage is low though there is power. UPS has batteries that provides back up power. When the power is gone, the battery provides voltage to the PC so that you can save your work. But it does not provide unlimited power. There are two types of UPS:

- **Standby UPS:**

SPS has a battery that begins generating power as soon as the unit detects a sag in the power supply. It takes only a split of seconds to come online. The disadvantage is that till the UPS become online, your data might get lost.

- **Online UPS:** It provides electricity to the PC all the time. It uses electricity from the AC outlet to simply recharge its batteries. When the power goes, the data is not affected because the UPS is supplying power.

- **Surge Suppressor:** Surge suppressors help to absorb power surges so that your computer does not feel their effects. They come as either separate modules or incorporated in the UPS.
- **Voltage Stabilizer:** It is a transformer that delivers relatively constant output when output voltage changes over time. The output voltage is regulated using transistor.
- **Battery:** Computer has a Chip that combines real time clock and non-volatile memory. This chip is the CMOS chip(CMOS RAM). They are designed to consume low power.
- ***Generators*** – where an organization requires the computer hardware to be powered for an extended length of time, a generator may be installed in addition to a UPS.

Self Check 3	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

II. Fill the blank space.

1._____when power levels drop to virtually zero, or in other words there is NO power.

2._____ Is the opposite of a brownout. It is where voltage levels increase above that which is specified at the outlet eg above 240 volts

3._____A short sharp and very sudden increase of voltage, that also drops just as quickly eg a 240 volt supply jumps to 1000 volts or more for a period of as little as 20 milliseconds.

4._____ help to absorb power surges so that your computer does not feel their effects. They come as either separate modules or incorporated in the UPS.

5._____ Computer has a Chip that combines real time clock and non-volatile memory.

Note: **Satisfactory rating – 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Information Sheet – 4	Determining and applying requirements when moving hardware

4.1. Determining your needs

Before any venture into selecting any new equipment or services, it is important to have a clear understanding of your needs. If you don't fully understand your needs then it is not possible to ensure those needs are correctly met. In other words, know exactly what you want before you try to get it.

4.2. Undertake a requirements analysis

While we will not be examining all the finer details of performing a proper requirements analysis, it is worthwhile covering some of the basics.

Firstly, it is vitally important to put your goals into clear and concise terms. This might be in terms of a problem definition, or business plan for expansion, or upgrading your capabilities. Your definition should not include any details of specific solutions as far as equipment, suppliers etc.

You should also include a set of criteria such as time and cost limitations, types and levels of support, etc. If you document all these requirements, when you finally make your decision and implement it, you will be able to determine if it constitutes a successful project or not.

After considering your overall goals and criteria, you can then put into simple and uncomplicated terms what would be a solution to the problem or requirement.

Evaluate your alternatives

Collect all the information you can about the types of equipment available, the suppliers of that equipment, the training required to use the equipment or associated programs.

You need to have an open mind about the alternatives. Do not think that there is only one right choice, as there are always viable options. For example, you may not need to purchase all new equipment when a few upgrade options may be both acceptable and economical. There is always more than one option!

Once you have a comprehensive list of what is available, compare that list with any organisational guidelines and policies that are in place. Many large organisations and government departments have set criteria for purchasing equipment. It's necessary to

familiarise yourself with those guidelines before making any recommendations or purchases. There may be organisation guidelines on the minimum standards required for equipment. Those standards might relate to:

- international or industry standards
- supplier restrictions, approved suppliers or other requirements
- purchasing guidelines (there may be different guidelines depending on the amount of money to be spent)
- minimum warrantees and/or guarantees
- support levels required
- how often equipment should be automatically reviewed or updated etc.

Making recommendations

After reviewing all the information above, you would then make recommendations, or make the purchases.

The important point to note is that if you do not have clearly in mind the equipment and services that you need, it is unlikely that you will make the best choices. In addition you may make the best choices in equipment, etc but there may be organisational reasons why your selection will not be approved.

Standards

Compulsory standards

In Australia, as in the rest of the world, there are many **standards** with which equipment needs to comply. These standards may be from both International and Australian government bodies or from industry groups.

Some of the most important standards organisations are:

International Organization for Standardizations (ISO)

ISO is the world's largest developer of standards. An ISO Standard can be anything from a four-page document to one several hundred pages long, and they will be increasingly available in electronic form. It carries the ISO logo and the designation 'International Standard'. In most cases, it is published in A4 format — which is itself one of the ISO standard paper sizes.

Australian Communication Authority (ACA)

The Australian Communications Authority (ACA) is responsible for regulating telecommunications and radio communications, including promoting industry self-regulation and managing the radio frequency spectrum. The ACA also has significant consumer protection responsibilities.

Standards Australia

Standards Australia is an independent organisation, not directly associated with government, although the Commonwealth Government and State governments are listed among its members.

Australian Electrical and Electronics Manufacturing Association (AEEMA)

Australian Electrical and Electronics Manufacturing Association (AEEMA) is the leading industry body representing Australia's information and communication technology (ICT), electronics and electrical manufacturing industries. AEEMA members supply infrastructure, products and manufacturing-related services to Australian and world markets.

Federal Communications Commission (FCC)

The Federal Communications Commission (FCC) is an independent United States government agency. The FCC is charged with regulating interstate and international communications by radio, television, wire, satellite and cable.

Institute of Electronic and Electrical Engineers (IEEE)

The Institute of Electronic and Electrical Engineers (IEEE) promotes the engineering process of creating, developing, integrating, sharing, and applying knowledge about electro and information technologies and sciences.

There are many more bodies that determine standards in a wide range of Information and Communication Technology (ICT) related products and services. When selecting any product, whether for domestic or commercial use, meeting the appropriate standards should be the first thing that is checked. Often compliance with the standards is easily recognised by the stickers and stamps on the products and its packaging.

standardization

One of the most beneficial features about the general design of computer systems is that they are modular. While for many they seem like black boxes and the inner workings are a mystery, they are in fact made of mostly standardised components that are connected in standardised

ways. This is called an open design and is generally considered to be responsible for the success of the PC (Personal Computer) platform over the last two decades.

Standardisation enables the relatively easy interoperability of different components within the computing world. It is the single most important factor that provides the choices that make the PC so flexible and accommodating. It is what makes it possible for the average person to make his or her own custom machine or to repair one that uses standard components. It's not always perfect, but it beats the alternative: a closed design, where one company or group of companies controls what hardware you can use in your system.

In order to get the real benefits of standardisation, however, one must make use of standard components and designs. Unfortunately, some PC designs abandon the open nature of standard PC designs by incorporating proprietary designs. These are systems where the PC maker has decided to use components that are not standardised, or has implemented standard components in a non-standard manner.

The designers of such systems usually have good intentions. They typically decide to make use of proprietary designs because they feel they can deliver a better product to the customer at a lower cost if they do this. Sometimes this is the case as some people like the special features of certain proprietary designs.

The problem with proprietary designs is that they aren't standard. By moving away from standardisation, proprietary designs give up the advantages of standard components. Here are some of the more important issues with such systems:

- **Choice and flexibility:** Proprietary designs are less flexible than standard ones. You usually have fewer choices in components when you buy the system, because the design will usually be based around specific choices made by the company's engineers.
- **Expandability and upgradeability:** Proprietary systems are more difficult to expand or upgrade than standard ones. If they are not designed to use standard components then you are limited in your expansion and upgrade options to whatever the manufacturer allows. This means you have fewer options, and you will also usually pay significantly more for any components you try to buy. If a new technology comes along a year after you buy your machine, you have to hope that the manufacturer will decide to support it.

- **Service:** PCs made from standardised components can be repaired by any competent PC technician, with some research and assistance. Proprietary systems must be worked on by those who have been specifically trained in how they are constructed. Again, this reduces your options and usually increases your costs.
- **Repair:** With a proprietary system you must go back to the manufacturer for any replacement parts for the system. These usually cost far more than standardised replacements, if they are available at all.
- **Comprehension:** Proprietary systems are more difficult to understand than standard ones, which matters if you want to really know what's going on. Worse, in some cases the proprietary nature of some subsystems is often not made available. As an example, standard IDE/ATA hard disk channels, found in virtually all PCs, support two devices (such as a second hard disk or CD/DVD drive). Some companies create their systems so that their IDE/ATA hard disk channels only support one device, but they don't mention this in the product manual. This leads to much frustration when someone tries, for example, to add a second hard disk to that system and it doesn't work. They will usually think it is a problem with the hard disk.

It's not the case that a system is either 'standardised' or 'proprietary', there is much scope for movement along those two points in design. Some PCs are made entirely of standardised components, but proprietary machines may still use at least some standardised parts. It can be a voyage of discovery to find out what is standard and what is not in such a machine.

The most proprietary designs are the all-in-one systems that include everything in one physical case, which are sold like appliances. Be very careful of such designs, because if anything goes wrong, everything is affected. If your PC has the logic components and the monitor in the same case, what happens if the monitor fails, or you decide you want a bigger one?

As for the more specialised notebook PCs, they all should be considered proprietary. This is one of the reasons why you should only consider a notebook if the portability of these units can be justified.

Quality

One of the most difficult tasks in the selection of computer components, or systems, is in determining quality. What represents a quality product? Possibly one of the most important

things to about quality is that you need to define and determine it for yourself, and ignore the claims made about it.

We could attribute certain aspects to a product that help determine its quality. Attributes such as performance levels, typical failure rate during manufacture, durability, etc. What is high-quality for you depends entirely on what is important to you. Here are a few different aspects of quality to keep in mind. You have to decide which of these, if any, are important to you. And for most people, there may well be other critical issues not mentioned:

Features: One aspect of quality may be the features of a product compared to competing products. Most would consider a product that has significantly more capabilities than another to be superior, all else being equal. Very often it is not equal. For example, it is quite common for product X to have more features than product Y while sacrificing other quality aspects.

Form, fit and function: For many, quality is in part defined by the way the item looks, how its parts fit together, and its overall feel. Does it look professionally made? Do the components mesh together smoothly? Does it seem solid? This is the 'kick the tires' school of quality, and it definitely has some validity. These are rather subjective notions, but no less important for being a matter of personal judgment.

Design and build: While the capabilities of most computers are defined primarily by their constituent components, the whole is still greater than just the sum of the parts. How the unit is designed and the care with which it has been assembled can be very important. Some manufacturers may add special enhancements to their products that some people consider to improve the quality.

Reliability: Everyone who buys a product wants it to last a long time and work without problems. Products that break frequently or wear out quickly are of lower quality than those that last a long time and remain trouble-free. But once again it may not be that simple, as a product with more features has more potential parts to fail. It's easier to make a highly reliable simple widget than a highly reliable complex one.

Service: The quality of a product is definitely affected by the quality of the company that sells and supports it.

Quality, like many other key attributes of any product, is an exercise in trade offs. More quality usually costs more money, whether you are talking about computers, clothes dryers, cars or

anything else. Quality is also a matter of the pride of the company making the product, and that's not strictly a matter of how much money you throw at a problem.

Example: purchasing a 'quality' motherboard

Let's consider the example of purchasing a motherboard. The one factor in choosing a motherboard that is probably over-emphasized by most suppliers and by many high-end users is **performance**. Often the word performance is commonly interpreted as speed. But that is deceptive, as performance should not only encompass speed but stability, reliability, compatibility and other factors that are important to the individual user. A board that can run every application thrown at it and never crash may be described as a great performer by one user, but be called a poor performer by another who only wants to run a limited number of programs extremely quickly.

Most users look at the various **benchmarks** provided on the hardware-oriented websites and choose one of those that get the higher marks. Unfortunately, these comparisons focus strictly upon the speed of the motherboard, and completely ignore the other important issues such as reliability, compatibility and stability. Basically any number of motherboards using the same chipset will almost certainly be within a few percentage points of each other as far as benchmarked speed is concerned, and not noticeable to most users. Actually, benchmark results should probably be the last consideration when selecting a motherboard, not the first.

While some of the hardware-oriented websites also claim to test motherboards for stability and reliability, this is very likely not the case. In order to test for either of these, the motherboard would need to be exposed to many days, or even weeks, of stress testing under various conditions. You can be certain that any reputable motherboard manufacturer has probably already done this with their prototypes, so once again we can assume that most motherboards from major manufacturers will be very close in this regard.

Hardware **compatibility** is the ability for various components from different manufacturers to seamlessly integrate, ie work together without problems. Hardware compatibility is an area that is extremely difficult to test, even for the manufacturer. The main reason for this is that the open architecture of the PC platform allows manufacturers to vary in how they implement certain standard features, to best suit their own particular needs. Because of the large number of manufacturers and components, testing every possible combination is virtually impossible. Because of this, compatibility testing will typically consist of testing those components that are determined to have a large market share. In this case, only time in the field will truly determine how compatible the motherboard is with various components. If you have the need to use a

device that is not one of the most commonly used, you may wish to find out if the manufacturer has tested it already. Most vendors and manufacturers will not warranty compatibility problems unless they have specifically stated that the device in question will work.

Hardware compatibility list (HCL)

One offering by Microsoft, that is of real assistance, is their **Hardware compatibility list** (HCL). A HCL is provided with most of their operating systems. In an environment where significant investment in equipment is to be made, it is a worthwhile resource to use in product selection.

Just to complicate the issue of quality a little further, some hardware websites claim to evaluate the quality of a motherboard by looking at the components used (SIMM/DIMM slots, capacitors, etc). Using this definition, it is impossible to determine quality based upon a single motherboard, and certainly impossible by merely looking at it. It is entirely possible to design and construct a motherboard out of average quality components that has a higher quality in the finished product than one that is poorly designed or constructed using high quality materials.

Quality should be a measure of the overall percentage of equipment that meets or exceeds their stated specification. It is no coincidence that industry quality awards are given to those companies with the best **process**, not the ones that use the best materials.

Self Check 4	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

I. Write the answer briefly

1. Define International Organization for Standardizations (ISO)?

2. Define Institute of Electronic and Electrical Engineers (IEEE)?

3. What is Hardware compatibility?

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Information Sheet – 5	Determining and applying suitable storage principle

5.1. Introduction

We need to have an awareness of possible consequences of in appropriate storage of hardware, peripherals and Media. Based on the nature and characteristics of the hardware we will determine how and where to store them. Points to consider when storing hardware, peripherals and storage media including:

- Climatic effects
- OHS considerations
- OHS standards
- Ease of access.
- Workstation
- Ventilation
- electrical safety
- manual handling
- Security
- Stability
- Posture

5.2. Storing equipment

You will find that manufacturers will almost invariably require that equipment should be stored in the same packaging in which it was delivered. While this is valid, in principle, often it can be impractical. Empty packaging can consume significant storage space, which may seem not justifiable on a cost basis. However, if you do not have on-site support then to return equipment to the supplier, you will need enough to cover the basics. For example, if you have five printers from one manufacturer, you may choose to keep the packaging of one printer.

Just like locating equipment, when storing equipment you must consider the factors of temperature, humidity, dust etc. Although if equipment is not in use then such factors as temperature are less of an issue than if the equipment were in service ie in current use.

5.3. Manufacturer's requirements

When handling computer equipment, it is advisable to follow the manufacturer's guidelines on handling and storage. The most obvious place to find that information would be the User Guides/Manuals that accompany the product.

While some documentation can be difficult to find, in a cupboard full of manuals, it is also common to have no documentation for the equipment in printed form. These days, many of the manuals and manufacturer guidelines are in electronic form supplied on floppy disk or CD-ROMs.

One of the best avenues, to locate the current information, would be the Internet. If in

5.4. Locating equipment

Sometimes when determining the most appropriate location, there are competing interests. From a security viewpoint, it may not be advisable to locate important network servers within easy access from the general public, or even unauthorised employees. But from an accessibility viewpoint, it maybe convenient for service personnel to have easy and unsecured access to all equipment. Still, there are the physical services (such as power, phone, network communications etc.) where equipment could be placed in the most convenient and cost-saving location close to outlets and connectors.

5.5. Security

When locating equipment you would need to determine the priorities and adjust or compromise the competing interest accordingly. For example, if you have a network server that contains sensitive accounting and/or payroll data, you would not want general staff (meaning those that should not be handling account/payroll data) to be able to gain access. You could of course restrict access by software such as username/passwords etc., but that would not stop someone from physically taking the hard disk drive in order to steal or copy it.

Where sensitive or critically important hardware is concerned, it would be advisable to locate the equipment in a secure location, such as a lockable cupboard or room. Access can then be more traditionally controlled by security key access.

5.6. Accessibility

Consider for a moment that you are a service technician where you go out on location to various businesses. You are called to fix a problem with a server or other equipment, but when you arrive you find the equipment is locked in a tiny cupboard, where the person with the key is

out. When you finally gain access you find it buried under a pile of boxes and papers etc. Get the picture!

When locating equipment, take into account that from time to time someone will need to physically access it.

Disposing of Used Equipment

- Various guidelines for disposing of equipment:
  - Manufacturer documentation
  - Local environmental regulators
- Danger posed by monitors and power supplies
  - Residual charge in capacitors can cause shock
  - Modern devices discharge if unplugged for 60 minutes
  - Older devices may require discharge with a probe
- Destroy secondary storage devices with sensitive data

Self Check 5	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

I. Write the answer briefly

1. List Points to consider when storing hardware, peripherals and storage media?

2. Define Disposing of Used Equipment?

Note: **Satisfactory rating – 1 points** **Unsatisfactory - below 1 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

6.1. Total cost of ownership

The initial purchase price of a computer hardware device is only part of the total cost of the device, over the lifetime of the device. Additional costs will include:

- costs of hardware and software upgrades
- costs of consumables. For devices such as printers, the cost of replacement print cartridges over the lifetime of the device can often be greater than the initial purchase price.
- maintenance costs
- cost of technical support
- cost of training

6.2. Support

Technical support is provided by manufacturers for users after the purchase of a computer hardware device. Access to this support is commonly limited to users who have registered the purchase of the product. Forms of technical support include:

- telephone support
- email support (usually with a guaranteed response time)
- access to support on internet such as:
    - frequently asked questions (FAQs)
    - troubleshooting guide
    - downloads of latest drivers and software updates

6.3. Compatibility

Compatibility is the ability of a system or a product to work with other systems or products without special effort on the part of the customer. One way products achieve interoperability is to comply with industry interface standards. For example, a memory module is compatible with a motherboard because the manufacturer of the memory module and the motherboard both work to the same industry standard.

6.4. Technical specifications

Once the business requirements have been considered, the technical specifications of the hardware device need to be evaluated. Areas for evaluation include the following:

- processing speed of the CPU
- storage capacity of the hard drive
- size of memory (RAM)
- software capabilities
- compatibility with existing systems
- upgradeability

The technical specifications to be considered will depend on the computer hardware device to be purchased. For example, technical specifications to be considered for a printer include:

- interface – USB or network
- resolution – measured in dots per inch
- printing speed – measured in pages per minute
- memory
- paper capacity

6.5. Occupational Health and Safety (OH&S) Requirements and safe work practices

In NSW, the OH&S legislation includes the Occupational Health and Safety Act 2000 and the Occupational Health and Safety Regulation 2001. Work cover NSW has the responsibility for administering this legislation.

Employers have a responsibility to provide a safe and healthy workplace for all employees. It also requires all workers to be aware that they have a duty to follow safe work practices to prevent injuries to themselves or other workers.

Organizations will develop procedures for safe working practices as a tool for implementing their OH&S policies and training staff.

For further information click on the following link: Apply occupational health and safety procedures

6.6. Manual handling

Computer hardware devices and consumables such as printer paper boxes can be very heavy and care should be taken when manually handling these objects.

Manual handling is one of the most common causes of accidents in the workplace. Workcover NSW <<link to http://www.smartmove.nsw.gov.au >>

defines manual handling as:

"any activity that involves lifting, lowering, carrying, pushing, pulling, holding or restraining. It may also include stretching, bending, sustained and awkward postures, and repetitive movements."

Recommendations on practices to reduce the risk of manual handling injury at work include:

- hold the load close to your body
- store loads close to where they will be used
- store heavy loads near waist height
- use mechanical aids such a trolley when lifting heavy loads
- don't lift heavy loads when sitting down

To find the weight of a device refer to the device specifications in the user manual. Always check the manufacturer's recommendations before handling.

6.7. Safe electrical work practices

Computer hardware should be located close to a suitable electrical outlet. The use of long extension cords is a trip hazard. If no power outlet is available, a new fixed power outlet may need to be installed. Any fixed electrical installation is required by law to be installed by a licensed electrician.

Cables should be kept away from the floor, and a person's workspace. Cables on the floor are easily damaged by trolleys and chair castors.

Use switched power boards and not double adapters or piggy backed plugs.
Routinely inspect cables for any damage. Damaged cables should be disconnected and removed.

Testing and tagging refers to the practice of testing electrical equipment (which is designed for connection by a flexible cord), by an appropriate person. If the equipment is compliant a tag is attached which is marked with the name of the person or company who performed the test, and the test date or retest date.

Any component such as a computer power supply which has a mains (240 volt) power connection can only be opened and repaired by a qualified technician. CRT monitors can have very high electrical potential levels even after they have been switched off and must only be opened by a qualified technician.

Electrical circuits for fixed wiring are protected from overload by a circuit breaker. The circuit breaker will trip if the circuit is overloaded. If this happens, it is an indication that the number of electrical appliances on that circuit should be reduced.

Self Check 6	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

I. Write the answer briefly

1. Write additional costs ownership?

2. Write technical support include?

3. List the technical specifications of the hardware device need to be evaluated?

Note: **Satisfactory rating – 1 points** **Unsatisfactory - below 1 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Information Sheet – 7	Considering OHS standards and environmental concerns

7.1. Introduction

Regardless of the industry in which you work, there are legal requirements that insist on establishing a safe work environment. There exists an Occupational Health and Safety Act in all states of Australia. It describes the general requirements necessary to ensure a safe and healthy workplace. It is also designed to reduce the number of injuries in the workplace by imposing responsibilities on employers, employees and others.

Manufacturers of equipment will also provide health and safety information related to their products. It is advisable to review some of the typical requirements that a manufacturer may put forward.

In order to effectively promote a safe work environment, it is prudent that safe work practices be adopted. We will also take a look at how to determine safe work practices.

7.2. An overview of the Occupational Health and Safety Act and Regulation

The fundamental purpose of Health and Safety legislation is to:

- secure and promote the health, safety and welfare of people at work
- protect people at a place of work against risks to health and safety arising out of any activities of people at work
- promote a safe and healthy environment for people at work that protects them from injury and illness and that is adapted to their physiological and psychological needs
- provide for consultation and cooperation between employers and workers in achieving the above
- ensure that risks to health and safety at a place of work are identified, assessed and eliminated or controlled
- develop and promote community awareness of occupational health and safety issues
- provide a legislative framework that allows for progressively higher standards of occupational health and safety to take account of changes in technology and work practices
- protect people (whether or not at a place of work) against risks to health and safety arising from the use of machinery that affects public safety.

In New South Wales, the *Occupational Health and Safety Regulation 2001* is intended to support the earlier *Occupational Health and Safety Act 2000* in achieving reductions in the

incidence of workplace injuries and disease. It replaced all the regulations made under the *Occupational Health and Safety Act* back in 1983 and others. Much of the legislation being replaced was outdated and overly restrictive.

This current set of regulations adopts a performance-based approach to occupational health and safety while still maintaining specific controls in highly hazardous areas. The best practice approach requires that regulatory proposals:

- have clear objectives and focus only on fixing identified problems
- regulate the ends and not the means
- minimise the number of government agencies involved
- promote certainty through clearly stated criteria for the assessment of applications for approvals, permits, licences, etc and publicly indicated timeframes for the assessment process
- are simple for users to understand
- are easy to enforce
- have a high voluntary compliance rate
- are subject to regular review
- do not restrict competition
- maximise benefits and minimise costs
- Use commercial incentives rather than command and control rules, for example by:
    - information provision
    - encouraging quality assurance backed up by a statute only where necessary
    - providing accessible legal remedies so that consumers, rather than government, can act to enforce their rights without prohibitive costs
    - shifting risk management from government to the private insurance market.

7.3. Determine safe working practices

Training

All staff members undertaking tasks that may be hazardous should be given, or have, the appropriate experience and/or qualifications. Organisations should have recruitment procedures that should ensure that persons chosen to undertake tasks have the necessary competencies. All employees should receive training where appropriate to ensure they possess the required skills and experience to carry out their tasks safely.

Training should include the knowledge of the **Safe Work Procedures** (**SWP**). Safe Work Procedures are written guidelines for all work activities that have been identified as posing some form of risk. It may include:

- Lifting and carrying
- Handling hazardous substances
- Working in confined spaces
- Use of particular equipment, eg drill, measuring device, cutting tool or even a computer.

If a serious accident or injury occurs, and the matter is taken to court, it would be wise if the employer were able to prove that the appropriate training had taken place. So upon completion of training (or an evaluation of competencies) the employee should sign a form acknowledging that they are aware of the particular safe working procedure. This can also form a safeguard for the employee, ensuring that management are fulfilling their responsibilities.

Risk assessment

One of the easiest ways to achieve safe working practices is to be prepared in advance. Being prepared means to: gain knowledge of the things that can go wrong and how to correct them. In other words there must be some form of risk assessment undertaken. The simplest and most practical form of implementing safe practices is to create **checklists** which cover the areas that need particular attention. By using a checklist you will avoid oversight and possible legal ramifications in the event of serious injury to a person, or damage to expensive equipment.

The more questions, and the more specific the question, the more likely that all risks will be identified. If a risk is not identified, then it stands to reason that preventative measures will not be taken to minimise injury. Carefully consider and compare the two checklists below for detail, clarity and ease of use.

Manual handling checklist

	Yes	No	Comment
All manual hazards in the workplace have been documented.			
Control measures have been implemented to eliminate the risks associated with manual handling or steps taken to minimise risks.			
Adequate information, instruction, training and supervision are provided to ensure that risks from manual handling are minimised.			
Control measures have focussed on job or task redesign, so that work may be carried out without the risk or to reduce the risk of manual handling.			
Mechanical or other manual handling aids (trolleys, ramps etc) have been provided where these can reduce the risk of manual handling.			
A system is in place to: • monitor & review control measures • encourage employees to report activities that could present the risk of injury.			
A system is in place to ensure that all accidents, incidents and near misses, injuries and ill health involving manual handling are reported, investigated and recorded, and appropriate corrective measures are implemented.			

Self Check 7	Written Test

Name:_____ Date:_____

Instruction: Answer all the questions listed below, if you have some clarifications- feel free to ask your teacher.

I. Write the answer briefly

1. Write the fundamental purpose of Health and Safety legislation?

2. Write Safe Work Procedures are written guidelines for all work activities that have been identified as posing some form of risk?

Note: **Satisfactory rating – 1 points** **Unsatisfactory - below 1 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

1. **BOOKS**
2. **https://training.gov.au/Training/Details/ICTSAS506**
3. **web1.keira-h.schools.nsw.edu.au/faculties/IT**